Opportunities for Cooperation in SSL Industry

NEMA SSL Section Overview

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Many groups involved in SSL today!

- Broad categories with <u>some examples</u> are
  - **Trade associations** (e.g. **NEMA –SSLS**, IES, IEEE…)
  - **Government - Industry** cooperation (e.g. DOE in cooperation with NGLIA, NEMA SSLS, …)
  - **Industry - Academic** consortia (e.g. ASSIST, MIT-OSBA…)
  - **Standards organizations** (eg. IEC, ANSI, NIST, SAE...)
- Can this effort be focused into creating standards and infrastructure that account for the unique advantages of SSL (without the burden of legacy constraints)?

OUTLINE

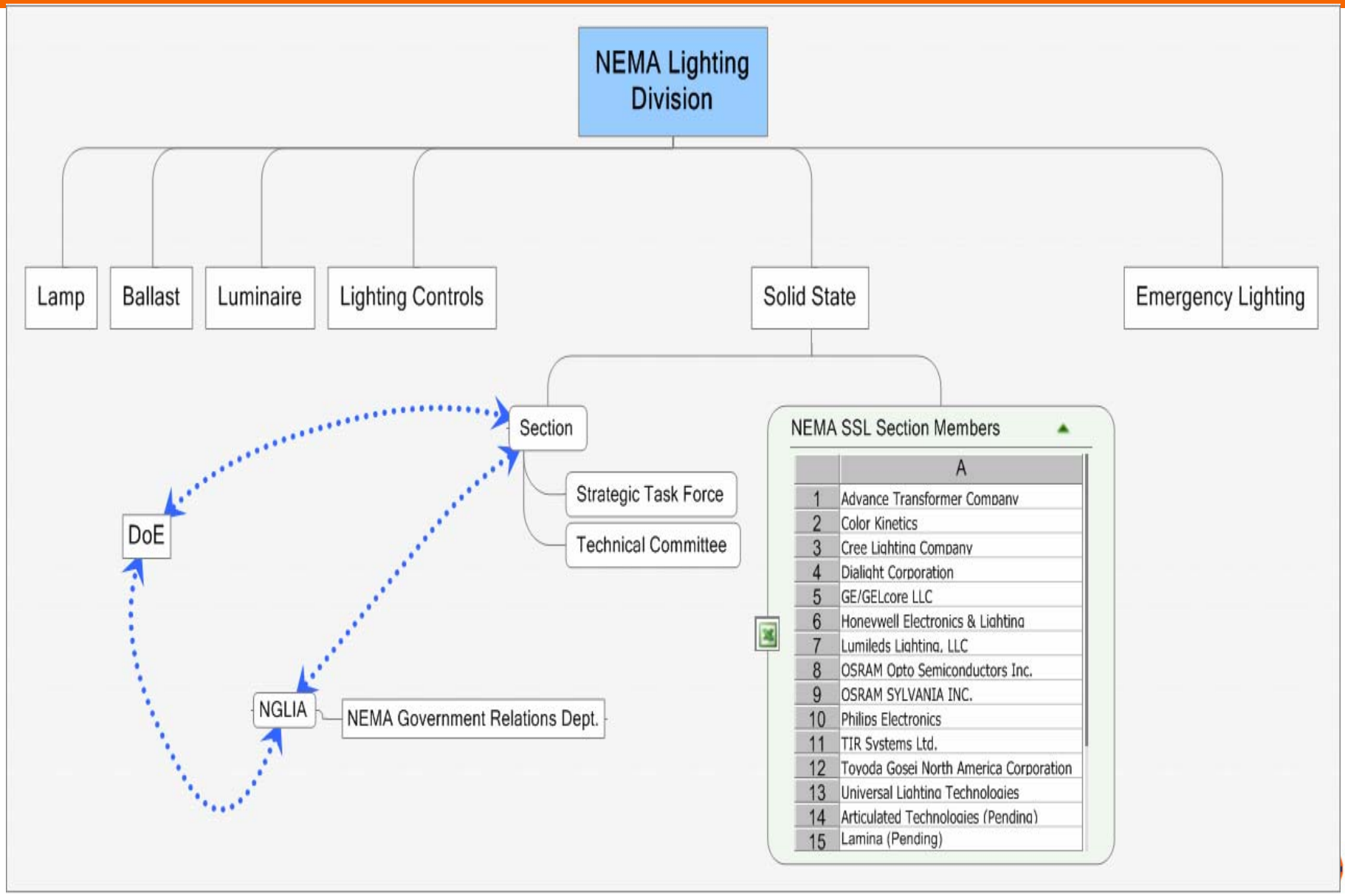
- The SSL Section
- The Section's strategic vision
- Ongoing activities
- Looking back, and looking ahead

SSL SECTION

"The Solid State Lighting Section is tasked with *integrating* solid state light sources with existing *lighting practices* and the creation of new practices to fully exploit the technologies *potential*"

http://www.nema.org/prod/lighting/solid/

ORGANIZATION



Solid State Lighting Section Scope

- The Solid State Lighting Section encompasses products and technologies
  - Semiconductor Light Sources - Lighting Emitting Diodes (LEDs), Laser Diodes, Organic LEDs, and any other semiconductor light source.

- ***Working jointly with other NEMA Sections***, the SSL Section will also cover in its Product Scope aspects of the following which pertain to the *unique requirements of Solid State Lighting Devices*:
  - Luminaires (and associated hardware)
  - Ballasts (Power supplies, mechanical and electronic controls)
  - Lamp and Emergency Lighting
  - Software for operation or control

- Partnering Organization - NGLIA

The spectrum of cooperation in the SSL Industry

Technology Sources: Companies, Natl. Labs, Academic research

Consumers: Endusers, Specifiers, Designers & Architects

e.g. **NGLIA**

NEMA – SSLS
(Clearing House for SSL information in collaboration with many standards orgs)

e.g. ASSIST, CLTC, MIT-OSBA

DOE started with technology development and extending to commercialization support

SSL Strategy

- Strategic Task Force created to look at NEMA SSL Roadmap
  - Establish strategic vision for the industry
  - Develop a roadmap
  - Define specific actions on a near term basis that help the membership to succeed

Strategy Taskforce Framework

Roadmap for SSL Section Task Priorities (in preparation)

NEMA SSL Section Roadmap Priority →	1	2	3	4	5	6	7	8
	2005 - TIMEFRAME - 20XX							
Activity →	**SSL White Papers**	**Glossary of Terms**	**LED Assembly Level Definitions**	**Metrology Standards for SSL Assembly Levels**	**Interface Standards** •Electrical •Thermal •Optical •Control •Mechanical	**Operational Standards** •Lumen Size •Wattage •Function	**Safety Standards** •UL •NEC •IEC	**Regulatory/ Energy Star**
Section Champion		Bill Kennedy(?)		**Instrument Systems** (suggested by B. Kennedy) Or **NIST**				
Resource 1	**TIR** •Solid State Light Q&A – Ashdown 2005 •Specifying SSL – Phototmetry and Colorimetry – Ashdown 2005	**TG** •Glossary of Terms **Lumileds** Draft proposal from C. Jones 2/05	**TIR** See Page 3 attached draft	Die & Package Level Measurement – •**Lumileds** •**Cree** •**TG** •**Instrument Systems** •Etc..				
Resource 2	**IESNA** "Introduction to LEDs" – Dale Work	**IESNA** LM-74 **CIE** TC 2-50 "LED Definitions"	**CIE** TC 2-50	Higher Level Measurements •**Instrument Systems** •**NIST, IESNA, CIE, ANSI** etc.				
Comments								

Technical Section Summary

Technical Committee Chair: Kevin Dowling, Color Kinetics
Program Manager: Ron Runkles, NEMA

- For SSL – Technical activities are a crucial focus!
- NEMA SSLS – plans to be the clearing house for reliable, well accepted information
- Many technical ambiguities to be addressed, e.g. “lifetime”, ratings, lumens, LPW etc…
- The goal to avoid replication of work, but quickly assess (and endorse) – available guidelines where reasonable
  - e.g. DOE *E** needs some of these *now (LPW)* – NEMA SSLS would like to support this effort
- In the short term develop *working guidelines*, as the standards organizations continue their work.
- Where necessary, Section will work with other groups (inquiries invited) to study and develop necessary information.

SSL Drivers

- Efficacy
  - Power (W), Light (Lumens)
- Functionality
  - Applications
- Quality
  - Color, Light, Distribution etc.
- Cost
  - Capital cost, Ownership cost
- Standards are needed to define these measures!

SSL Standards Efforts

- Photometry - Light Measurement
- Light Quality - Appearance
- Electrical/Controlgear - Safety
- Photobiological - Eye Safety

Summary of technical activities

- Glossary of Terms
  - Some important solid-state lighting terms are still somewhat ambiguous and need to be defined before basic standards can be written.
  - The Section has developed a working draft glossary that was turned over to the newly formed ANSI Working Groups for solid-state lighting for review and further refinement.

- Matrix of Standards A matrix of standards impacting solid-state lighting products has been developed and is maintained by the Section to:
  - Provide a roadmap of tasks to complete
  - Make sure we cover all critical aspects – GAP ANALYSIS
  - Work with national and international organizations including UL, IEC, CIE, and other standards,
  - Eliminate duplication- Review effectiveness
  - Rewrite where necessary with NA manufacturers viewpoint

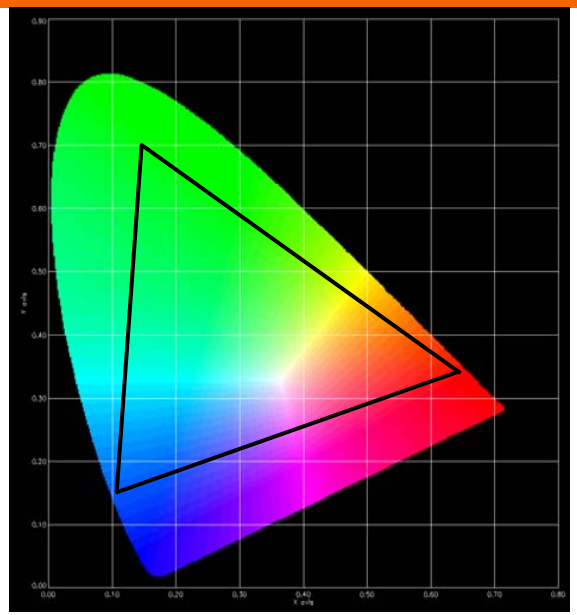
Controls and Electronics

- ANSI Working Groups for Solid-state Lighting. ANSI Working Groups C78-09 for light sources and C82-04 for control devices were established December 1, 2005, at a meeting in Rosemont, IL.
  - Working Group C82-04 will begin investigating what circuitry and power characteristics might be standardized, such as power factor, harmonics, transients, etc
  - Working Group C78-09 will develop a proposal for parameters that characterize solid-state lighting for which the group may want to standardize, such as light source life and thermal, electrical, and photometric characteristics..
  - Both groups together will consider the development of standards for electrical and mechanical connections and for interchangeability. The next meeting is scheduled for May 2, 2006, in Rosslyn, VA.

Safety

- UL Safety Standards
  - The Solid State Lighting Section is working with Underwriters Laboratories Inc. on the consolidation of safety standards pertaining to LEDs.
  - Currently, safety requirements for LEDs are located in and **applied from more than twelve different UL safety standards**.
  - UL plans to deliver a draft **consolidated document**, or Outline of Investigation, to members of the Section and ANSI Working Groups by the end of February 2006.
  - UL expects to organize a Standards Technical Panel (STP) for solid-state lighting. Section member companies will participate in the activities of the STP - the summer of 2006

The problem of specifying LEDs today



Consistent reporting of performance criteria

LED specification example

- Nominal Current: 350mA
- Nominal Power: 1W
- Nominal Output: 50 lumens

- But not all at the same time!
  - LED driven at 350mA may result in 1.2-1.4W
  - LED driven at 1W power level < 350mA
  - 50 lumens/die for nominal 1W part
- 30 lpw at 25C continuous?

Performance Characterization

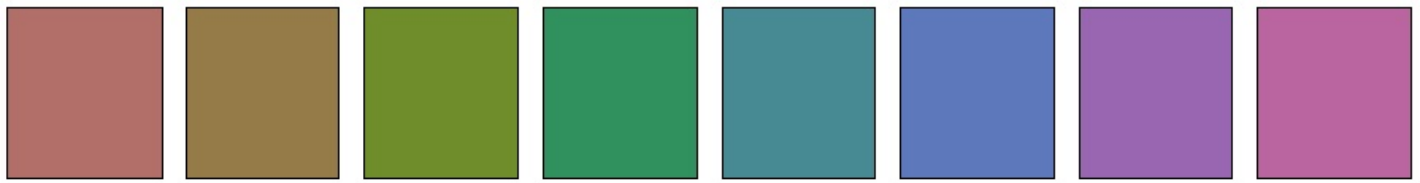
- IESNA Performance Standards
  - Section's Technical Committee has initiated **round robin testing** through the IESNA Testing and Procedures Committee
    - Photometric measurement procedures for **luminaires** using LED light sources.
    - Currently resolving differences in measurements resulting from the first round of round robin testing
  - IES plans to install an additional committee on SSL (pending IES board approval) - Mar 06
  - There is a need to look at device level standards (currently an update of CIE 127 in progress by NIST/Y. Ohno)

Light is how you COLOR it!

- Color Characterization and Communication of new color approach

  - The Lighting Systems Division (Lamp and SSL Sections) project:
    1. to develop a useful color characterization metric **that will include LEDs**
    2. to develop a meaningful way to communicate color to end users

  - Focus groups conducted using expertise of LRC and support from DOE and EPA, to explore a simple means of communicating color to end-users.
  - EPRI with Division support organized a Symposium on developing a color characterization metric **February 6-8, 2006, in Orlando, FL**.
  - Division also working with NIST on **color quality scale** (one way to characterize color rendering of light sources)
    - harmonize current CRI for traditional light sources, but also include LED light sources,



Proactive approach to environmental responsibility

- Photobiological Safety Standards.
  - **From a safety standpoint, LEDs have been treated both as lasers** (e.g., in IEC standard 60825-1) (IEC 1998; ANSI1988) and as lamps (CIE 1999; ANSI/IESNA 1996a,b).
  - The Solid State Lighting Section will undertake the development of photobiological safety standards.
  - Section has retained the services of Dr. Rolf Bergman for 2006 and 2007 (involved in development of ANSI/IESNA series of RP 27 Standards on Photobiological Safety and similar CIE requirements)
- International Commission on Non-Ionizing Radiation Protection ICNIRP Statement on eye safety.
- Environmental
  - RoHS (Removal of Hazardous Substances)
  - WEE - Waste removal for Electronics at Enduse
  - *Out of scope for most SSL efforts but we must be aware of efforts*

Support of DOE Energy Star activities

- Through NGLIA E* Task Group
  - Since September 2005, NGLIA Energy Star Task Group working with PNNL on process of developing draft Energy Star SSL program criteria.
  - Further work will be based on DOE-approved roadmap for criteria development
  - Additional support will be provided from NEMA SSLS

SSL Annual Report

- In preparation:
  - Summarize the strategic vision of membership
    - Focus on being the clearing house for SSL industry information
    - Drive deployment of SSL technology
  - Summarize key trends in industry, specifically those affecting membership
  - Identify opportunities for cooperation with other agencies
  - Highlight significant member milestones
  - Publish the report on NEMA website for distribution
- All current members are eligible to participate
- Section membership has been requested for contributions to Annual Report
- There is a “Seat at the table” -- even for small companies!

Contact: Kurt Riesenberg, Director, Lighting Division

Is having good technology enough for market success?

- Making the case (again) for the appropriate infrastructure
- What is the VALUE offered to customers by SSL?
- What are the basic market criteria – are they always pragmatic?
- NEMA SSLS goal is to be on taking ideas to profit for its manufacturer members

Compact fluorescent lamp

What happened?

- **Expensive**
- **Poor light quality**
- **Flicker**
- **Expectation failure**

Energy efficiency *alone* was insufficient to drive demand

This has finally changed

What is next for SSLS?

- Focus on DEPLOYMENT!
- Linkage of the technology to the infrastructure!
- How does SSL fit in the buildings of tomorrow?
- Looking into branding options - how to instill confidence in this industry?
- Lighting gets no respect!
- Lighting CEOs' directive to develop "a message"
  - Promote EPACT 2005
  - Technology and Taxes
  - Create Unified Lighting Industry message

Courtesy: LRC – ASSIST/Dr. Narendran
•Demonstration of a prototype building infrastructure
•Demonstrates exploitation of the unique benefits of SSL
•Explores the new building paradigm under SSL regime!

Solid State Lighting is not a spectator sport!